FROGS: a daily 1° × 1° gridded precipitation database of rain gauge, satellite and reanalysis products for assessments

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Objectives

In support of the assessment effort recently initiated under the auspices of GEWEX/GDAP and IPWG (Haddad and Roca, 2017) and supporting a dedicated joint effort by the WCRP Grand Challenge on Weather and Climate Extremes and GEWEX/GDAP to analyze extreme events and their characteristics (Alexander et al., 2018 GEWEX Newsletter), a large database of gridded precipitation products has been assembled.

Here we present the database that includes ground-based, satellite and reanalysis products and a preliminary analysis of the ensemble of products.

Current status of the database

All the products listed in the table have been regridded and formatted with a common:

- 1°x1° daily grid and
- annual file format (netCDF)

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Product shortname and version	Period used	Spatial coverage	Use of rain gauges data	Use of IR satellite data	Use of MW satellite data rainfall estimate	Main Scientific References and ATBD
Satellite based quasi global						
3B42 v7.0	1998-2016	50°s-50°n	Yes	Yes	multiple platform	(Huffman et al. 2009)
3B42 v7.0 IR	1998-2016	50°s-50°n	No	Yes	No	(Huffman et al. 2009)
3B42 v7.0 MW	1998-2016	50°s-50°n	No	No	Yes	(Huffman et al. 2009)
3B42 RT v7.0	2000–2017	50◦S-50◦N	Yes	No	Yes	Huffman et al. (2007)
3B42 RT v7.0 uncalibrated	2000–2017	50◦S-50◦N	Yes	No	Yes	Huffman et al. (2007)
GSMAP-RNL-gauges v6.0	2001-2013	50°s-50°n	Yes	yes	Yes	(Kubota et al., 2007)
GSMAP-RNL-no gauges v6.0	2001-2013	50°s-50°n	No	yes	Yes	(Kubota et al., 2007)
GSMAP-NRT-gauges v6.0	2001-2017	50°s-50°n	Yes	yes	Yes	(Kubota et al., 2007)
GSMAP-NRT-no gauges v6.0	2001-2017	50°s-50°n	No	yes	Yes	(Kubota et al., 2007)
PERSIANN CDR v1 r1	1983-2017	50°s-50°n	yes	Yes	No	(Ashouri et al., 2015)
CMORPH V1.0, RAW	1998-2017	60°s-60°n	No	Yes	Yes	(Xie et al., 2017)
CMORPH V1.0, CRT	1998-2017	60°s-60°n	Yes	Yes	Yes	(Xie et al., 2017)
GPCP 1DD CDR v1.3	1997-2017	90°s-90°n	Yes	Yes	One platform	(Huffman et al. 2001)
IMERG v6 early uncal	2000-2018	90°s-90°n	No	Yes	multiple platform	(Huffman et al. 2015)
IMERG v6 late uncal	2000-2018	90°s-90°n	No	Yes	multiple platform	(Huffman et al. 2015) New!
IMERG v6 final uncal	2000-2018	90°s-90°n	No	Yes	multiple platform	(Huffman et al. 2015)
IMERG v6 final	2000-2018	90°s-90°n	Yes	Yes	multiple platform	(Huffman et al. 2015)
Land Only						
CHIRPS v2.0	1981-2016	50°s-50°n	Yes	Yes	No	(Funk et al. 2015)
CHIRP v2.0	1981-2016	50°s-50°n	Climatology	Yes	No	(Funk et al. 2015)
SM2RAIN-CCI	1998-2015	Global	No	No	No	(Ciabatta et al., 2018)
Ocean only						
HOAPS	1996-2014	ocean only	No	no	Yes	(Andersson et al., 2017)
Satellite based regional						
TAPEER v1.5	2012-2016	30°s-30°n	No	Yes	multiple platform	(Roca et al, 2018)
TAMSAT v2	1983-2017	Africa	Yes	Yes	No	(Maidment et al;. 2017)
TAMSAT v3	1983-2017	Africa	Yes	Yes	No	(Maidment et al;. 2017)
ARC v2	1983-2017	Africa	Yes	Yes	No	Novella andThiaw, 2013
COSH	2000–2018	South America	Yes	Yes	Yes	Vila et al. (2009)
Rain gauges based						
CPC	1979–2017	60°s-90°n	Yes	no		Xie et al (2010)
GPCC First Guess v1	2009–2016	60◦s 90◦n	Yes	No		Becker et al., 2013
GPCC Full Daily v1	1982–2013	60◦s 90◦n	Yes	No		Becker et al., 2013
GPCC Full Daily V2018	1982-2016	60°s-90°n	Yes	No		(Schneider et al., 2018)
REGEN long	1950-2013	60°s-90°n	Yes	No		(Contractor et al., 2018)
REGEN	1950-2013	60°s-90°n	Yes	No		(Contractor et al., 2018)
Atmospheric reanalysis						
MERRA 1	1979-2015	global				Rienecker et al. (2011)
MERRA 2	1980-2017	global				Gelaro et al. (2017)
JRA-55	1958-2017	global				Kobayahi et al. (2015)
ERA Interim	1979-2017	Global				Dee et al (2011)
CFSR	1979-2017	global				Saha et al. (2010)

Intercomparisons of extreme

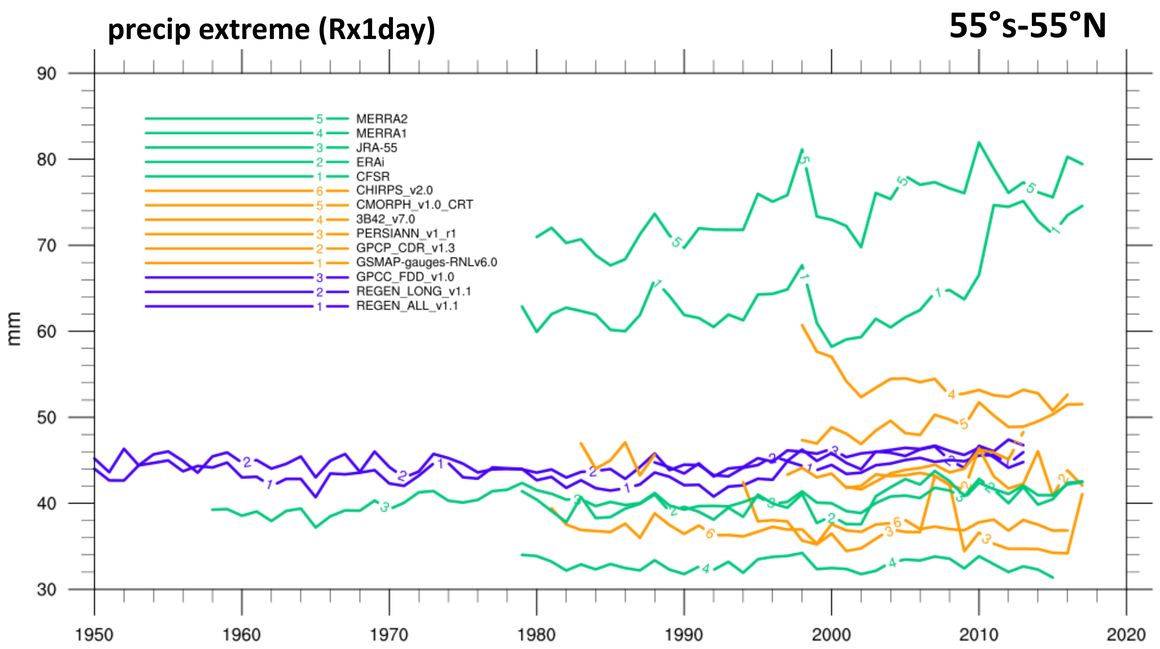

Figure 2: RX1day time series.

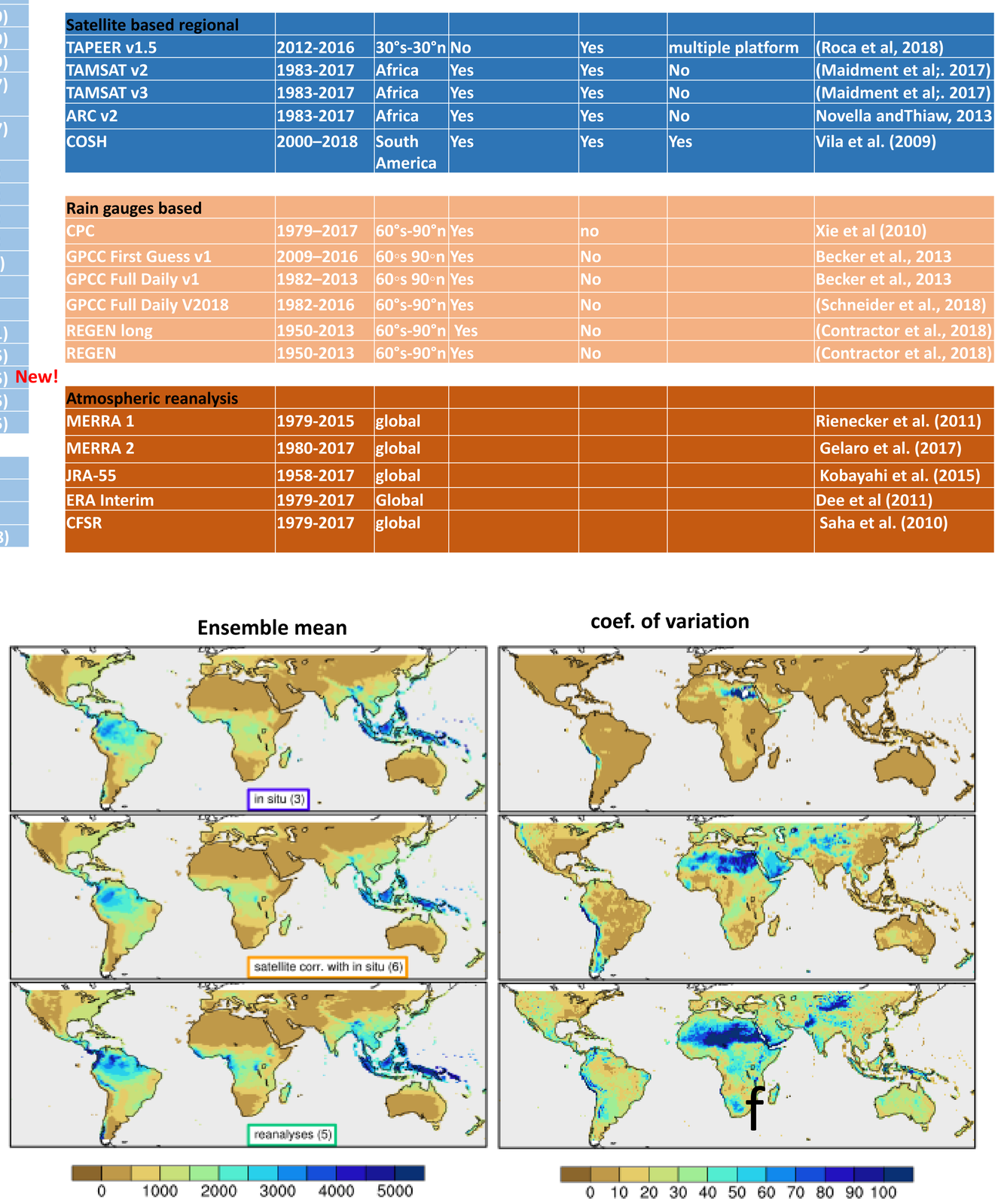

Figure 3: RX1DAY ensemble mean and coefficient of variation for 2001-2013 statistics. for 3 groups of products. (top/purple) Ground based products (middle/orange) satellite with gauges adjustment (bottom/green) reanalysis from Bador et al ., 2019

The time series (figure 1) confirms an early finding (H. Masunaga, Personnal communication): the behavior of each members of the ensemble for the total precipitation is different for the extremes. It also shows the large spread of the ensemble for the extremes metric. While most of the satellite and reanalysis products underestimates the extremes compared to the 3 ground based estimates, MERRA-2 and CFSR shows much higher values and exhibit a slight increase from 2000 on-wards not seen in the other datasets. 3B42v7 is also characterized by a excess value and a negative trend, unseen either. CMORPH slightly overestimates the extremes and exhibits a strong positive trend that the other datasets do not show. The satellite datasets that rely on GPCC are closer to the ground based sub-ensemble. Note that JRA-55 and ERAi are relatively in better agreement with the ground based estimates than the other reanalysis. The spatial distribution of the annual extremes (figure 2 e and f) further help to identify the sources of the above discrepancies among the ensemble of products. The largest departures among the 3 sub-ensembles appears over South America and the Maritime Continent. The latter region being characterized with the largest sub-ensemble spread as far as the reanalysis are concerned.

- Roca, R., Alexander, L. V., Potter, G., Bador, M., Jucá, R., Contractor, S., Bosilovich, M. G., and Cloché, S.: FROGS: a daily 1° × 1° gridded precipitation database of rain gauge, satellite and reanalysis products, Earth Syst. Sci. Data, 11, 1017-1035, https://doi.org/10.5194/essd-11-1017-2019, 2019.
- Bador et al. (2019) "Diverse estimates of annual maxima daily precipitation in a variety of quasi-global land observations" under review in ERL

Access the dataset : http://dx.doi.org/10.14768/06337394-73A9-407C-9997-0E380DAC5598
More information at: http://frogs.ipsl.fr

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